THE INFLUENCE OF COMMUNITY ISOLATION ON STUDENT ACHIEVEMENT

Technical Report

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INSTITUTE FOR EDUCATIONAL RESEARCH AND DEVELOPMENT

MEMORIAL UNIVERSITY OF NEWFOUNDLAND

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INTRODUCTION

This study is an examination of the influence of community isolation on student achievement. It follows in the tradition of the large scale investigations of schooling effects which have been reported in the last 25 years (e.g., Coleman et al, 1966), although the variable of isolation is, as far as we can ascertain from the literature, unique. Glasman and Binianimov (1981) have summarized this literature, reporting on some thirty studies since 1959. According to their review, only one study (Kiesling, 1969) has focussed to any extent on rural education, and the results of even this one study do not provide any information on the role of isolation. Thus, our findings make a contribution to the debate on the determinants of student achievement, but from a perspective quite different from earlier work. Another further very important difference between this study and previous ones is that this study is set in rural Canada, leading to two important consequences: first, the method of financing education is quite different from that of the United States which might affect the strength of any link between area wealth and money spent on schooling; and second, the sample on which our results are based is virtually all white. The homogeneity of our sample can be viewed as either a disadvantage or an advantage, depending on whether one wishes to study the influence of race on achievement, or the influence of other variables without the confounding effect of race. Since our main concern is isolation, we consider our sample to be advantageous.

For purposes of putting this report in context, it would be

difficult to improve on the review by Glasman and Binianimov (1981). At the end of their summary of research, they produce a qualitative path analytic model of the determinants of school outcomes, based on their interpretations of the results of the studies reviewed in their paper. Their model incorporates six groups of variables: student background characteristics, school conditions, instructional personnel, school-related student characteristics, student attitudes, and outputs. By comparison our analysis results in a quantitative path analytic model incorporating student background variables in the form of socio-economic and isolation data, school conditions in the form of class size, characteristics of the teaching force, and outputs in the form of achievement. Glasman and Binianimov (1981) report that path analysis is rarely used in school effects studies, although there are more examples in the literature than the one in their review. As well, in our analysis we undertake an examination of outlier data which attempts to shed light on variables which influence the achievement scores from small subsamples of the schools in our sample. This secondary analysis recognizes one of the limiting assumptions of the present type of analysis, namely that the factors influencing school achievement across a large number of schools in different circumstances may not be constant in magnitude across those schools. While this point may seem obvious, its recognition contributes to resolution of unexplained variance which might otherwise be classified as "error".

The field of school effects research, and our report are complex enough that a brief overview of our methods is necessary in order to provide some organizing principles for our quite abbreviated and

selective review of a vast literature. Our goal was to focus on the issue of community isolation and its effect on student achievement. Logic and necessity both suggested that we work at the level of the community and/or school, rather than at either the district or individual level. As will be seen, most of our data points consist of only one class per grade and one school per community, so there is little distinction in our data between the class, school or community level.

Our model incorporates teacher factors as intermediate variables, and socio-economic and isolation data as exogenous variables. Student achievement by standardized test scores is our dependent variable. Since we were unable to find in the literature any large scale systematic attempts to quantify isolation, the first major issue discussed in our report is this attempt. We suggest several possible measures for estimating isolation, and then, on the basis of both logical and empirical analysis, reduce their number for input into the path analytic part of our investigation. Since a major difficulty in this study was collection of data we spend considerable space on the process of amalgamating data from several sources: the Canada Census, various other government sources, the schools themselves, the provincial Department of Education, a credit agency, and many organizations which could be classified roughly as providing community services.

Our basic data file contains over forty variables, and in the interest of producing readable, relatively simple results, we have taken several decisions in our analytic process with which other investigators might not agree. Specifically, we have been ruthless in eliminating variables from our path analytic diagram, which is complex enough without

having, for example, eight or so different isolation indices included. Also, our achievement measure is the Canadian Test of Basic Skills, (1977) for which we have five subscale sources as well as the composite scores. It would have been possible, indeed potentially even interesting, to produce a different path analytic diagram for each of the six dependent variables. We judged this to be information overload, and instead chose to do our main analysis on the composite scores only, and to treat differences in results for the other variables, based on the path model developed for the composite scores, as a side issue.

Finally, our data are data of convenience, and regression-like techniques are, at best, a blunt instrument. While we were not in a position to conduct interview data on, for example, perceived isolation, or to collect information about how often individuals travel away from their isolated conditions, we were able, by analysis of outlier data, to identify those situations where our linear procedures were least adequate, and to then attempt to find variables which had a strong predictive influence on isolated groups of outlier schools, but not enough influence to enter our overall equations with any significance. While this post hoc analysis answers no profound criticisms of large scale data manipulation investigations, it does offer potentially fruitful food for thought.

BACKGROUND

As a basis for organization, we shall deal with the various relevent issues of the school effects literature roughly in the order in which they are handled in the Glasman and Binianimov (1981) review.

Glasman and Binianimov do not report the size of effects, but merely their direction, and then only report investigations in which there were clear results. Thus, we have information from their review on whether there was agreement or not among different studies investigating the same issue when each had clearcut (i.e., significant) findings, but we cannot easily find, on the basis of their review, how many studies investigated the same phenomenon but found it had no significant effect. Thus, we do not know, when they report four studies all showing the same direction of effect for the same factor, whether this was four of four, or four of eight. Given the scope of their review, however, this is a small limitation.

Our dependent variable is achievement, specifically as measured by a standardized test. Approximately half of the studies reported in Glasman and Binianimov deal solely with cognitive outputs of schooling, while the other half deal also with non-cognitive outputs, for example, self-concept, educational aspirations, and attendance. We recognize that our data limit us to a fairly narrow range of the important functions of schools when we restrict ourselves to achievement (see, for example, Barker and Gump (1964) for a report of the non-cognitive advantages of smaller schools), and that we are even more restricted by the necessity of limiting our achievement measure to a standardized, multiple-choice test (for example, see Madaus and Airasian, 1980). However, given the choice, under limited resources, between breadth and depth of sampling, in this case we chose breadth.

Glasman and Binianimov summarize the results of their reviewed studies concerning the effects of family and individual student background.

They report very consistent findings, in the expected directions, for the influence of family size, income, occupational status, possessions, parental education, and the family "educational environment". The only variable not showing any consistent pattern is student sex. Similarly, Walberg and Marjoribanks (1976) report a 1925 finding of a correlation between family size and ability of 0.30. These results are at the individual level, however, and Hauser's (1969) report that there is only nine percent of total (individual) variance in family size at the between-school level suggests that an effect for family size may be difficult to detect in our data, despite a tradition of large families in some rural locations.

Coleman (1966) reports that less than two percent of achievement can be predicted from family education added after other background variables, which contrasts with the results of Sewell and Hauser (1975), who had standardized path coefficients in the order of 0.20 for each of father's education and occupation when they were the only predictors of achievement. The path coefficients of Sewell and Hauser drop dramatically when individual intelligence is introduced into the prediction equation. This finding is supported by Spady (1976), Williams (1976), and Hauser (1969), and points out one of the limitations of our data, the lack of intelligence measures. Lack of intelligence data in the prediction equation tends to exaggerate the influence of socioeconomic variables. On the same topic, Crawford and Stayrook (1981) report that aggregating beyond the individual level also exaggerates the influence of background variables, but the general problem of level of aggregation of the data will be discussed below.

Further results on topics surrounding socioeconomic effects should be mentioned. A study for the Maryland State Department of Education (1978) attempted to find patterns among outlier schools in a prediction of standardized achievement results from standardized intelligence data. In this study, positive outliers were identified in situations with a higher proportion of two-parent families in the community than average. As well, and this is not precisely a socio-economic effect, but may be considered closely related, there was a similar positive effect associated with greater parental concern with education. McDill and Rigsby (1973) support this role of parental involvement.

The Maryland report contains a succinct statement of the differences, on personal inspection, between low and high outlier schools - one gives a sense of "running", and the other of "being run". We have no similar data to report for our schools, and no direct measures of "context" effects, in the sense of measures of school atmosphere and related variables such as community attitudes or student attitudes. We have, however, attempted to approximate some of these constructs with measures of community educational level. Both Bidwell and Kasarda (1975) and Coleman et al (1966) report that community attitudes have a strong, though indirect effect through teacher quality, on achievement. Among other variables, our study concerns the influence of both community education and isolation on achievement, both directly, and indirectly through teacher quality. Since the Canadian educational system does not link funding of education as directly to local wealth as does that in the United States, we have the opportunity to separate the questions

of what attracts better teachers, the better pay in more prosperous areas, or, in some sense the "quality" of the community.

Glasman and Binianimov report consistent effects for the racial composition of schools, a factor which is absent in our data. Following Sewell and Hauser (1975), who report that the effect of race in prediction equations is to attenuate the predictive power of other variables, we expect that the homogeneity of our sample will increase the sizes of the effects we find, all other things being equal.

Next in their article, Glasman and Binianimov deal with the influences of school facilities, a topic on which we have no information at all. While many of their reviewed studies investigated the influence of school characteristics such as use of tracking, quality of library, class size, physical facilities, and expenditures, results were noticeably inconsistent. As well, the influences of administrative structure of the school, teachers' salary and teacher turnover have all been mixed. Bidwell and Kasarda (1980) suggest that a possible reason for the regularity of these inconsistent findings is that we assume facilities effects are distributed equally across all students in the school, that is, that all students have equal access to good teachers, library resources, etc. This assumption goes against common experience, and may be the reason why school resource effects are difficult to detect. In other words, if a study could be designed to measure within school access to resources, a sizeable resource effect might turn up.

Although the issues of school resources pose interesting questions for other research efforts, our lack of such information is

not, in the context of previous research, a major drawback. Averch et al (1972), in a review monograph, conclude that effects of the schools themselves amount to only 5% of between-school variance, and that this effect drops to about 1% when student background is put into the equation. Hauser, Sewell and Alwin (1976) and Coleman et al (1966) have drawn similar conclusions.

One of the more intriguing aspects of quantifying isolation is the issue of access to cultural amenities, and how such access might be measured. We uncovered only two references to "culture" in the literature, and neither refers to access to cultural resources. Katzman (1968) developed what he called an index of cultural advantage for students in a sample of Boston area schools, but his index reflected father's income, education, and occupation, and as such should be considered a socioeconomic measure. As well, Spady (1976) reported a 1969 study of McDill, Rigsby and Meyers as an assessment of culture, but they were attempting to measure the culture of the school, in the sense of educational climate, and not the cultural facilities available to the community.

We realize, in our attempt to quantify cultural access, that our assumption that all individuals in a community make equal use of cultural resources is, at root, no better than the assumption that all students in a school have equal access to resources. We will return to this problem shortly, in our discussion of the level of analysis chosen (albeit by necessity) for this investigation.

Although there has been some investigation of these variables in small schools, the issue of isolation has not been a focus, and

results have not been directly applicable to the present situation. Averch (1972) reports a 1962 dissertation by Thomas, in which it was reported that there was no influence on school level achievement of the distance from the nearest community of 100,000 population or more. Rutter et al (1979) reported no school size effect in their study, but their analysis was based on only twelve largely urban schools. Keisling (1967) investigated schools in New York State, as mentioned above, and found behavior of data from small school districts (less than 2000 students) different from that of larger districts, and not nearly as predictable. His analysis, however, was at the district level. Commenting on his first study, Kiesling (1969) noted that school data is better than district data, because better teachers are free to move to schools of their choice within a district, given sufficient turnover, thus increasing the chances of finding a staff quality effect at the school level, but not at the district level. This observation fits into the perspective of the present study if we assume a tendency for better teachers, over the course of their careers, to move from isolated communities to those more urban or central. It is interesting to note that Kiesling (1969) experienced the same types of problems matching United States census data to school district data as we did with Canadian census data. As well, Kiesling found that, compared to large school districts, his smaller districts (fewer than 2000 students) in New York State behaved unpredictably, but that, in general, an index of occupational status was relatively more important in the rural setting.

A major controversy of the schooling effects literature has been

the level of analysis, individual, class, school or district, at which to undertake prediction. Bidwell and Kasarda (1980) have produced a thorough discussion of the issues, concluding that level of aggregation is a conceptualization issue, and not one of methodology. That is, the unit of analysis should be determined by the level at which the variables of major interest are conceived, and not by methodological considerations such as the proportion of variance available at each level, or the behavior of individual within-school, or between school correlation matrices. We accept this argument, as does Sirotnik (1980) and note that our major research question is isolation, which is essentially at the community level, as is our data. We accept the limitations of our methodology in aggregating individual level data for achievement, socioeconomic conditions, and teacher quality to the community level, but point out in our defence that aggregation of teacher data can be viewed as an attempt to measure the cumulative effects of several years of schooling by a staff of similar quality, and that aggregation of socioeconomic data can be considered an attempt to assess community concern for education as well as school context.

In our analysis, we lose variance which is available at the individual level. Averch (1972) reports that school level variation is about 30% of individual level variation for many variables of interest. Hauser (1969) reports lower ratios of between-school to total variance, at 9% for school resources, and 24% for father's education. We do not, however, lack sufficient power for analysis at the school or community level. Barcikowski's (1981) calculations suggest that our analysis has ample power for detecting even small effects.

We close this section with a few methodological comments. Both Sirotnik (1980) and Keisling (1969) suggest that one method of overcoming the lower stability of data points based on smaller schools is to weigh the data by school size. While this makes methodological sense, by giving greater weight to the more reliable measurements, we have chosen not to do so, as our main interest is in the small isolated schools of our sample. Thus, to diminish their importance in our prediction equations would be self-defeating.

Our main methodological tool is path analysis, using Duncan (1975) as the basic reference, and two exceptionally clear articles by Wolfle (1980, 1982) as our working documents. After the path analysis, we move to outlier or residual analysis, which means that, in effect, we treat the path equations as nothing more than linear regressions. Our concern with outliers is prompted by some of our comments above, as well as by several references to the non-linearity of the phenomena of interest. For example, Fagan and Ponder (1981) found stronger predictive relationships in low achieving schools, the Maryland (1978) report found a great many consistent patterns in their outlier analysis, and Spady (1976) warns that teacher experience and quality should not be considered a simple, linear phenomenon.

In summary, then, our major issues are the quantification of isolation, and the influence of isolation on achievement, both directly, and indirectly through teacher factors. Our report next presents a detailed description of our sample and data sources, followed by discussion of the isolation variables, our thinking leading up to the development of the path model, and the path results themselves. We conclude with

an analysis of the outlier schools and a brief report of the variation to be expected in our results if the dependent variable is not the composite score of the achievement test, but one of the subtests.

SAMPLE

Our sample was composed of the grade six clases in all schools in the Province of Newfoundland and Labrador in 1979. In October of that year, the Canadian Tests of Basic Skills were administered to all grade six students in the province. Our sample consisted of all students who completed all subtests of the test (over 98% of the students), aggregated to the school level. Schools in Labrador were removed from the sample because of unique isolation problems and complicating language and cultural differences. Within the two urban areas of St. John's and Corner Brook, we experienced difficulty mapping census data onto school boundaries, and as our concern was with isolation, these communities and their schools were removed from the sample. Two schools, Goose Cove and Conne River, were removed due to obvious errors in our data, and a further 17 (see Appendix 1) were removed either for missing data reasons, or because they were extremely tiny communities which happened to have no grade six students in 1979.

In the many situations where a community was served by schools of different religions, the data from each school were kept separate. However, there remained in the data file two communities, Deer Lake and Carbonear, served by two schools of the same religion each. In these two cases, student and teacher data were combined as if all were in the same building. There were 58 cases (see Appendix 2) of

schools containing younger children who fed into a different building for grade six. Since we wished to approximate the cumulative effects of the teaching force, in these cases the teacher data was averaged as if the students had spent their entire career up to grade six in one school. The final sample consisted of 317 schools. One late discovered case of missing teacher data yields 316 cases for some variables.

DATA COLLECTION

The data collected could be conveniently divided into four categories: achievement scores, school and teacher characteristics, community factors, and socio-economic information. The decision to use the school/community as the unit of analysis implies that, for purposes of assessing isolation, we have assumed that all students live at the school. As will be seen below, our use of a "commuting distance" measure in our isolation instrumentation makes this assumption more reasonable than it might appear on the surface. The reader unfamiliar with Newfoundland geography should note that, by and large, the rural population is distributed in discrete communities rather than over large tracts of agricultural land. Bussing of students is mostly from one community to another, rather than from farming areas into a central service community. By comparison to either the American or Canadian prairies, distances bussed are not large.

By necessity, our data sources are from different years: the 1976 Canada Census, the 1979 Newfoundland Standardized Testing Program, the 1978-79 Statistics Canada Teacher file, and assorted other variables

to be described below, mostly from 1979-1981. We defend this practice as we are interested in long-term, abiding influences on student achievement. If an analysis such as the present is to have any meaning, then we must be assessing characteristics of students and communities or schools which have some temporal stability, and are not an artifact of the teacher, student, or community cohort of a particular year. While our use of combined data from different years may be disturbing, note that each variable is internally consistent and taken from one time period only. Thus, for example, all employment data is taken from the 1976 census, reflecting an internally consistent, across communities, snapshot of the economic conditions of that year.

Our decision on the unit of analysis requires that all variables in the above categories be available at the school level rather than at the community or census level. Organization of the raw data to achieve this end required the mapping of the school catchment areas onto the community boundaries and census areas. Because of the small size of some of the communities in the study it was found necessary to examine the census data at the level of the enumeration area (EA). The EA is the smallest census collection unit and is approximately 350 households.

The first step in this mapping process involved obtaining, from school board offices, the lists of communities served by each school containing a grade six (Appendix 3). For the second step, it was necessary to find the EA(s) that corresponded to the communities feeding into each school. This information was available either from the 'Place Name Reference List' or the 'Enumeration Area Reference List', (Statistics Canada 1978), depending upon whether the community was

incorporated or not. In some cases it was found that a community was made up of several whole EA's and parts of others, while in other cases several very small communities combined to form a single EA. In all cases where an EA was divided between communities the portion of the EA population in each community was obtainable. Combining the outcomes of both of these steps produced a data set containing school code, school name, the number of whole or partial EA's making up a school catchment area, and for each of these EA's, its Statistics Canada identification number and the proportion of its population living in each community served by the school.

Variables

1. Achievement

For each grade six class in the sample, the school name, number of students and mean school values for the following variables were obtained from the Canadian Test of Basic Skills, Level 12, Version 4M (1977); vocabulary, reading comprehension, total language, total study skills, total mathematics, and total composite score. Frequency distributions for these scores are given in Appendix 4, Tables I to VI, as raw scores rather than grade equivalents.

2. Teacher and School Variables

Statistics for every teacher in each of the schools in the Province were obtained from Statistics Canada, (Canada Master, 1979). The following information was extracted for each teacher: school name,

and code number, total school enrolment, number of staff, school pupil-teacher ratio, teacher age, level of teaching certificate, total teaching experience, total teaching experience with the current board, staff position, staff specialty, school type (K-6, K-3, K-4, etc.) and grade(s) taught by the teacher.

Teachers in specified schools and areas were removed for the reasons given above. School with primary grades only were recoded to the same code as the schools into which they fed.

Since it was assumed that the grade six pupils in all the schools would have been influenced not only by their current teacher, but also by the teachers below grade six, it was decided to retain all teachers teaching from K-6 in the sample and take mean and median values for their characteristics.

Using the statistical package for the social sciences (SPSS, 1975) a second data set was produced by selecting from the complete teacher file, teachers teaching in schools containing a grade six class. Of the schools thus selected, only those teaching from K-6 were required. Thus, high schools were deleted, as well as high school teachers in all-grade schools.

Using SPSS, mean and median values for all of the school and teacher characteristics listed above for each school were produced. Frequency distributions for these variables are given in Appendix 4, Tables VII to XV. Our code names for these variables are introduced in the tables for ease of reference later. The mean value for the pupil teacher ratio (IRATIO) variable produced for each school should be viewed with some caution since the inclusion of a number of K-11 schools, having

lower ratios in the top grades, will have somewhat lowered the mean values.

3. Community Isolation Factors

Although we cannot ignore the fact that some pupils are transported for up to 45 minutes to school, it would seem plausible to assume that the distances would be small enough to allow the pupil and his family to avail themselves of the amenities of the community in which the school is located. Based on this assumption the isolation of the community containing the school was examined rather than that of the home community of the pupil.

Of the 317 schools in the study, 28% are located in communities with a population of less than 500 (Appendix 4, Table XVI), and over half (52%) are found in communities of less than 1000. Schools in communities of over 10,000 accounted for only 2% of our sample schools, but contained, naturally, considerably more than 2% of the student population.

Isolation was assessed in terms of commercial, medical and cultural facilities. There were four different criteria: services within the community, services within 45 minutes of the community, travelling time to minor facilities, and travelling time to major facilities. Not all twelve possible combinations of type of service and criterion were calculated, as it was felt that people would drive for 45 minutes for most commercial services, but would probably not venture beyond their own community for access to service clubs and other "cultural" facilities. (Our definition of "cultural", based on

available data, is admittedly questionable, and will be discussed further below.) Our four criteria were selected to reflect the isolation of relatively large remote communities, as well as smaller communities, whether particularly remote or not.

Commercial indices. With reference to the Newfoundland Service Centre Classification Scheme (Courtney, 1973) criteria were developed for distinguishing seven types or levels of communities; hamlet, minimum convenience, partial shopping, full shopping, tertiary, secondary and primary manufacturing (Table 1). Courtney based this scheme on that of the Atlantic Development Board (1969).

Each business activity in the community may be described using a four digit Standard Industrial Classification Code (SIC). The first two digits refer to the function of the business and the second two to the specific activity (e.g., 5013 - the 50 refers to wholesale and 13 to automotive parts). A list of SIC codes was obtained from the Dun and Bradstreet Reference Book (1980) for every community in the Province.

A data file was created with an identification code for each community, community name and a list of four digit SIC codes representing each business operating in the area. Using the first two digits of the SIC codes provided sufficient information for current purposes so conversions were made as follows:

i) wholesale businesses were combined into one category;

ii) retail businesses with certain exceptions were grouped together;

Table 1

Community Commercial Levels

Community Level	Minimum Business Required	4-digit SIC Codes Combined
1. Hamlet	Grocery	5411, 5441
	General Merchandise	5399, 5331
2. Minimum Convenience	"Hamlet" plus Gas &/or general repairs	5541, 7538
	Eat/Drink place	5812, 5813
3. Partial Shopping	"Minimum" convenience plus Hotel	7011
	Car repair	7539
	Family clothing	5651
	Dry goods	5699
	or 2 retail	
	General appliance	5719
	Furniture	5712
	Less than 5 other services	
4. Full Shopping	Partial shopping" plus lumber/building	5211
	Wholesale-less than 5	50, 51

Table 1 (continued)

Community Level	Minimum Business Required	4-digit SIC Codes Combined
	Retail-5 to 10	56, 59, 57, 72, 73, 76, 80, 79, 15, 16, 17
	Department store	5311
	Single family home Construction	1521
	Used car dealer	5521
5. Tertiary Manufacturing	Full shopping & retail-10 to 20	
	Wholesale-6 to 15	
	Services-11 to 20	
	New car dealer	
	Manufacturer-1 to 10	
6. Secondary Manufacture	Tertiary Manufacturing & Retail-21	
	Wholesale-16	
	Services-21	
	New auto dealer-more than 2	
	Manufacturer-10 to 15	
7. Primary	St. John's	

iii) the majority of services were combined (except 1521 - single family home construction);

iv) manufacturing concerns, including primary production, were combined.

Each community was examined, and using the criteria already established, classified into one of seven levels upon which the Dun and Bradstreet index was based. The distances between communities were obtained from route mileage data provided by the Newfoundland Department of Transportation (1978). Using speed limits and road conditions similarly provided it was possible to calculate 45 minute commuting distances from each school community. Communities within that distance were assigned the same value for the commercial (DNB) index as the school community. Frequency distributions of this variable showed that 61% of the schools were in a community defined as level 3 or less whereas 16% were in level 6 or 7 communities (Appendix 4, Table XVII).

Medical index. A Community Resource Inventory has been compiled by the Newfoundland Department of Health (1981). This inventory lists all medical services available in each community. By assigning a value to each type of service provided (Table 2), a composite score was produced for each community (Table 3). From the frequency distribution of this index (Appendix 4, Table XVIII) it appears that over half (58%) of the schools are located in communities with no medical facilities whatsoever and that 90% of the schools are found where the composite score for the community is less than 30 (Table 3).

A new variable, IMED45, was created to indicate the medical facilities available within 45 minutes travel time. Comparing the

Table 2

Medical Facilities and Values Assigned

Type of Service	Number	Value
Ambulance		1
Public Health Nurse	1 - 2	2
	3 - 5	3
	more than 5	4
Clinic or Community Health Centre		3
Doctors (G.P.'s)	1	4
	additional	3 each
Dentist	1	4
	additional	3 each
Hospitals	1 - 10 beds	5
	11 - 25 beds	6
	27 - 50 beds	7
	51 - 100 beds	8
	101 - 150 beds	9
	151 - 200 beds	10
	201 - 250 beds	11
	250 +	12
Specialist		3 each

Table 2 (continued)

Type of Service	Number	Value
Intensive Care	1 - 5 units	2
	6 - 10 units	3
	11 - 15 units	4
Dental Hygienist		3
Physiotherapist		3
Audiologist		3

Table 3

Classification of Communities Based on Medical Facilities

Composite Score	Index
0	1
1 - 10	2
11 - 29	3
30 - 40	4
40 - 89	5
90 - 140	6

frequency distributions of IMED45 and IMED (Tables XVIII and XIX, Appendix 4) it can be seen that although 90% of the schools are in communities with medical index levels less than 3, 41% are within 45 minutes travel time of at least a level four medical community.

Cultural index. This index is an attempt to quantify the extracurricular activities available in a community by examining the occurrence of library services, service clubs (Lions clubs only, as other organizations are limited to larger centres), Scouts and Guides. Library facilities existing in each community were categorized by the Provincial Librarian's office as either "full" library service which includes a specific building or "other" services involving bookmobiles or books by post. Lists of the Lions' clubs throughout the Province were obtained from Lion's district governors, and Scout and Guide headquarters supplied similar lists for all levels of Guide and Scout activity. A composite score was produced for each school community by assigning one point to each of Scouts, Guides and Lions Clubs, two points for "full" library service and one for "other" library service. This resulted in a range of composite scores from zero to five which formed the basis for the Cultural Index (ICULT). Table XX (Appendix 4) shows that of the school communities examined, 46% of the schools are located in communities that have none or only one of the activities under consideration and only 12% have all five.

Travel times. Distances and travel times were calculated from each school community to a level 4/5 commercial centre (IDNBT4), doctor (ITMED1) and to minimal hospital care (ITMED2). In the case of communities with no road connection, distances by coastal boat or

ferry were estimated using sailing schedules provided by CN Marine or private ferry operators. Frequency distributions of travel times are given in Table XXI, Appendix 4. For IDNBT4, 59% of the schools are less than 50 minutes from a level 4/5 community whereas 9% are more than three hours from a community at the same level. Sixty-six percent of the schools are less than 25 minutes from a doctor and only 4% have to travel for more than one and one-half hours to reach the same medical facility. Minimal hospital care may be reached within 50 minutes from 66% of the schools. Nine percent, however, are greater than three hours from such hospital care.

Lastly, the distances and travel times were calculated from each school community to a level 6/7 commercial centre (IDNBT6) and to full medical facilities (ITMED3). Reaching a level 6 commercial centre within fifty minutes is only possible from 24% of the school communities. Seventeen percent of schools however, are more than three hours from such a centre (Table XXI, Appendix 4).

4. Socioeconomic Data

Welfare. Social assistance was the only socioeconomic variable that was not available from the 1976 census. Information on the dollar value and the number of both long and short term welfare cases for each community was obtained from the Newfoundland Department of Social Services (1979).

Using the master list of schools together with the communities that feed into them, a file was created consisting of one record per school, each containing school code, school name, communities served

by the school together with their total welfare cases (long and short term) and dollar value. The combined assistance for each school catchment area was then calculated by summing individual community values to create a per capita welfare figure for each school area.

SES variables other than welfare. User summary tapes (Statistics Canada, 1978) containing the following 1976 census tables for all the enumeration areas in the Province were obtained from Statistics Canada (Ottawa):

i) EADEMB10 - Population 15 years and over by school attendance;

ii) EADEMA10 - Population by age

iii) EAECOB20 - Population 15 years and over by labour force activity;

iv) EAFAMA20 - Husbands in husband/wife families

- Wives in husband/wife families
- Lone parent families
- Families by number of persons
- Total number of persons per family
- Average family size

EAFAMB20. Husbands in husband/wife families by labour force activity. Wives in husband/wife families by labour force activity. Selected varables were extracted and combined to form a data set containing the following information for all EA's in the province:

i) total population age 15+;

ii) number age 15+ in school, including post-secondary;

iii) education of population age 15+ in nine categories: less than grade nine; grade nine or ten; more than grade ten; no high school certificate; high school certificate;

some post-secondary, non-university, no certificate; post-secondary, non-university, with certificate; some university, no diploma; some university, with diploma; university degree;

iv) population over age 5;

v) number employed;

vi) number unemployed;

vii) number of two parent families, including childless couples;

viii) number of lone parent families;

ix) total persons in families;

x) average family size by Statistics Canada definition (total number of persons in families divided by total families, including childless couples);

xi) number of employed husbands;

xii) number of employed wives;

xiii) number of employed lone parents;

xiv) number of families with no children at home;

xv) population ages 15-24

The data file containing the above information was combined with that indicating the EA's or fractions thereof in each school area to produce the following socioeconomic information for each school area. Our variable code names are introduced here for brevity and ease of later reference.

i) IPOP - school district population;

ii) IPRSC - proportion of 15-24 year olds in school;

iii) IPRBGS - proportion of adults with grade 8+;

iv) IPRPS - proportion of adults with some post-secondary, non-university;

v) IPRU - proportion of adults with some university;

vi) IPRLFA - proportion of adults with some university;

vii) IPREMP - proportion of adults not in school who are employed;

viii) IPRMEM - ratio of unemployed to employed adults;

ix) IPRLPF - proportion of lone parent families;

x) IPRGWH - ratio of working wives and lone parents to working husbands;

xi) IPREMH - proportion of husbands working;

xii) ICPF - number of children per family (childless couples removed from denominator);

xiii) IWELDOL - welfare dollars per capita.

Frequency distributions of (ii) to (xiii) are given in tables I to XII, Appendix 5.

Subsequent analysis was carried out using one master file which incorporated all variables calculated for each school district. The means and standard deviations of all variables are reported in Table 4 which also provides a summary of variables, their codes, and definitions.

RESULTS

Variable reduction

As indicated above, our first priority in analysing the data was to reduce the number of variables from the forty or more calculated on the basis of availability and any remote possibility of interest to

Table 4

Variable Codes, Definitions, Means and Standard Deviations

CODE	DEFINITION	MEAN	ST. DEV.
NSTUD6	Number of grade 6 students	24.656	23.032
IENR	School enrollment	183.566	132.177
ICASE	Teachers K-6	8.513	7.137
ISTAFF	Total school staff	10.063	6.591
IRATIO	Pupil/teacher ratio	17.375	3.214
KCTBSV	Achievement - vocab	16.464	3.126
ICTBSR	Achievement - reading	29.118	4.716
ICTBSL	Achievement - language	62.407	10.456
ICTBSW	Achievement - study skills	46.941	7.042
ICTBSM	Achievement - math	27.542	4.579
ICTBSC	Achievement - composite	183.167	27.448
MNAGE	Mean teacher age	81.035	5.088
MDAGE	Median teacher age	29.590	4.553
MNCET	Mean teaching cert.	4.100	0.731
MDCET	Median teaching cert.	4.144	0.801
MNEXPT	Mean total teaching exp.	9.248	4.169
MDEXPT	Median total teachng exp.	8.094	4.207
MNEXPB	Mean teaching exp. with board	6.783	3.127
MDEXPB	Median teaching exp. with board	6.150	3.064
MNEXPD	Mean experience elsewhere	2.469	2.220
MDEXPD	Median exp. elsewhere	1.440	1.978
IPOP	Pop. of school area	1621	2104
IDNB	Commerical index (school area)	3.230	1.962
IDNBT4	Travel time to DNB4	69.580	83.552
IDNBT6	Travel time to DNB6	121.811	94.428
IMED	Medical index (school area)	1.798	1.321

Table 4 (continued)

CODE	DEFINITION	MEAN	ST. DEV.
IMED45	Med. index within 45 min.	3.322	1.748
ITMED1	Travel time to Doctor	27.577	41.925
ITMED2	Travel time to small hospital	52.139	58.190
ITMED3	Travel time to full hospital	103.063	84.589
ICULT	Cultural index (sch. area)	2.129	1.676
IPRSC	Prop. adults in school	0.228	0.137
IPRBGS	Prop. adults with grade 8+	0.503	0.120
IPRPS	Prop. adults some post. sec.	0.090	0.049
IPRU	Prop. adults some univ.	0.058	0.038
IPRLFA	Prop adults in labor force	0.454	0.099
IPREMP	Prop. adults employed	0.362	0.103
PRMEM	Unemployed/employed	0.302	0.320
IPRLPF	Prop. of lone parent fam.	0.100	0.045
IPREWH	Working wives + LP/working hus.	0.359	0.155
LPREMH	Prop. husbands working	0.576	0.148
ICPF	No children/family	2.402	0.449
IWELDL	Welfare dollars/capital	121.521	112.384

a number conceptually and scientifically more manageable. A strictly empirical approach, where all the variables are put into the regression equation to see what comes out, does not qualify as appropriate methodology for the building of a scientific model. The approach we chose, instead, was to group the variables on a conceptual basis, and then rely on empirical results, both correlational and regression, to build the final model. The first step, then, was to reduce the number of variables within each of the groups: isolation, socioeconomic and teacher and school characteristics.

Such an approach is necessary, particularly with the isolation measures, as there is no literature available on the quantification of isolation. Table 5 contains the intercorrelations among the isolation variables, arranged with those measuring variables within the community (ICULT, IPOP and IMED) first, those referring to 45-minute commuting distance (IDNB, IMED45) next, those referring to travel time to minor facilities (ITMED1, ITMED2, IDNBT4) third, and those referring to major facility travel time (ITMED3, IDNBT6) last. The intercorrelations within each of these groups are enclosed in the lower half-matrix triangles. As can be seen, they tend to be larger than those outside the triangles (signs of the correlations can be ignored, as several measure times, so that those more isolated communities are assigned higher "scores" on these variables.) Other notable trends show that there is a high correlation between distances to minor facilities and to major facilities (in the rectangle), that the medical indices correlate quite highly with one another, and that the 45-minute retail index (DNB), on average, correlates relatively more highly than any

Table 5

Intercorrelations Among Isolation Measures

	1CULT	1POP	1MED	1DNB	1MED45	1TMED1	LTMED2	1PNBT4	1TMED3
1POP	.552								
1MED	.588	.558							
1DNB	.322	.334	.351						
1MED45	.330	.390	.397	.791					
1TMED1	-.336	-.297	-.246	-.429	-.412				
1TMED2	-.297	-.273	-.230	-.440	-.470	.681			
1DNBT4	-.221	-.237	-.169	-.490	-.380	.566	.592		
1TMED3	-.262	-.283	-.242	-.496	-.571	.558	.611	.476	
1DNBT6	-.280	-.294	-.243	-.491	-.452	.500	.505	.787	.785

other variable. It seems, then, that an appropriate strategy, if we are to capture all the important facets of isolation in our indices, would be to select one isolation index from each distance, that is, one from within the community, one from the 45-minute commuting area, and one or perhaps two from the times to more distant facilities.

Based on regression results, predicting CTBS Composite achievement from the isolation indices, this speculation is not borne out, probably due to the high correlation of IDNB with the other isolation variables. The order of entry of predictors, with multiple R in brackets, was: IDNB (.297), ICULT (.356), and IMED (.374). No other variables entered the equation using a cutoff of 0.05 probability, although IDNBT6 would have entered next at 0.09 probability. Thus, we have three significant predictors of achievement from among the isolation variables, the first referring to the 45-minute commuting area, and the other two referring to facilities within the community itself. If, at this stage, we were building a path model, we would probably force more isolation predictors into the equation, since, even though they might not add significantly to the total prediction R, they would nevertheless change the path coefficients noticeably. However, since we are engaged at this time in preliminary data analysis, we move to the socioeconomic variables having made a decision to enter, at least initially, no more than two or three isolation variables into the path diagram. The wisdom of this decision can be verified later, in post hoc dissection of the path diagram.

Table 6 contains the intercorrelations among the socioeconomic variables, arranged in groups in a manner similar to Table 5. Variables

Table 6

Intercorrelations Among Socioeconomic Measures

	IPRSC	IPRBGS	IPRPS	IPRU	IPRLFA	IPREMP	IPPNEM	IPREMH	IWEZDL	IPREWH	IPRLPF
IPRBGS	.410										
IPRPS	.343	.782									
IPRU	.298	.713	.615								
IPRLFA	.344	.532	.550	.516							
IPREMP	.204	.498	.525	.508	.899						
IPRNEM	.057	-.136	-.131	.162	-.226	-.516					
IPREMH	.123	.334	.359	.287	.705	.867	-.539				
IWELDL	-.090	-.071	-.041	-.145	-0.096	-.181	.155	-.228			
IPREWH	.172	.354	.268	.369	.283	.168	.010	-.174	.050		
IPRLPF	.137	.035	-1.024	.117	-.076	-.074	.040	-.082	.124	.189	
ICPF	-.123	-.194	-.163	-.105	-.273	-.227	-.010	-.116	.023	-.170	.018

related to community education (IPRSC, IPRBGS, IPRPS, and IPRU) first those related to economic wellbeing and employment (IPRLFA, IPREMP, IPRNEM, IPREMH, and IWELDL) second, and those relating to the family (IPREWH, IPRLPF and ICPF) last. Note that we are making no value judgment in grouping the proportion of working wives and lone parents as a family rather than an economic variable. Because of this ambiguity, we have placed this variable as the first of the third group, so that one can, if desired, easily group it among the second group by simply expanding the lower bound of the middle lower-diagonal triangle. However, as the results indicate, this particular variable bears little relationship to much else in the table which is related to either economics or the family. In fact, it has its strongest relationships with some of the educational variables.

It can be easily seen that the patterns among the intercorrelations of the socioeconomic variables are not nearly as tidy as those among the isolation variables. Correlations among the educational variables are quite expected, and given the generally low level of education in rural areas compared with urban areas, it would seem that the proportion of the population who have gone beyond grade school might be the most useful of these indices. This is borne out in part by the regression data discussed in the next paragraph. We defined the proportion of unemployed to employed rather than to the total in the labour force to avoid complete collinearity with the proportion employed. This exploration, IPRNEM, did not "work". The family variables seem not to be related to each other, nor to any of the other socioeconomic data. For simplification and selection from

among the socioeconomic variables, we turn to attempts to predict achievement from these variables.

With CTBSC as the dependent variable, only two of the socioeconomic predictors enter the equation at the 0.05 level or better. Again with multiple R in brackets, the predictors in order of entry are: IPRBGS (.457) and IPRSC (.475). Both these variables are from the education group. The next variable which might enter the equation, at a level of 0.12 is ICPF, and none of the employment variables have any predictive power above that of these first three. On the basis of these results, we decided to use only two of the socioeconomic variables as input to our path model. Note that the two educational variables are proportion of the population who have gone beyond grade school, and proportion of the adult (over 15 years) population who are still in school. These might be taken to reflect different aspects of education: the first the level of education of adults, and the second the general interest in education in the community.

One third group of variables is the teacher and school variables. In this analysis we are severely handicapped for two reasons: first, based on the literature we expect little predictive power from the teacher and school group, and second, our school variables are, for all practical purposes, useless. The school variable of pupil-teacher ratio is useless due in part to very low variability, which we attribute to the methods used in Newfoundland to allocate teachers to schools. While very small schools, those with fewer than 100 students, are allowed a slightly better ratio, teacher allocation is on a per pupil

basis, and except for what amount to rounding errors to avoid fractions of teachers, should be the same in all schools. This statement simplifies the situation slightly, for high schools are allowed more teachers per pupil than elementary schools. Thus, with our mixture of K-6, K-9, and all-grade schools, the pupil teacher ratios are not really comparable even if they had any variability, unless we subdivide the sample. Subdividing the sample is counter-productive, as the nature of the school organization is highly correlated with isolation. The final school variable is school size, which correlates highly with community size, already demonstrated to have little predictive power. Thus, our group of teacher and school variables is reduced to a group of teacher variables.

Table 7 contains the intercorrelations among the teacher variables. As expected, there is little relationship among level of teaching certificate and age or experience. We have created the variable of total experience with other school boards (rather than the present employer) on the assumptions that employment with a given school board implies employment at the one school, and that employment with other school boards somehow indicates desirability of the present location, as a school with a high proportion of teachers who have taught elsewhere suggests that it is in a community to which teachers desire to move. These assumptions are, of course, questionable, and unfortunately untestable with our data, but the relatively high correlation between experience elsewhere and certification level might be interpreted to indicate that more qualified teachers are more free to move than those less qualified. It should be noted that, in Newfoundland, teacher

Table 7

Intercorrelations Among Teacher Variables

	MDAGE	MDCET	MDEXPT	MDEXPB
MDCET	.107			
MDEXPT	.858	.007		
MDEXPB	.710	-.113	.829	
MDEXPD	.536	.168	.552	.126

salaries are not included as a school board budget item, but are paid centrally. Thus, school boards are free to hire the most expensive teachers they can find without any financial consequences to themselves.

There are two possible regression strategies for selecting teacher variables for inclusion in our path analysis diagrams. The first is to select those teacher variables which are best predicted by our isolation and socioeconomic variables. This method assures us of higher indirect effects of the isolation and socioeconomic variables through the teacher variables, and thus would help to make the point that isolation (or lack of it) is important to teachers. However, this approach was rejected on the grounds that our primary interest must be in teacher variables which effect student achievement, whether or not these variables are related to isolation and socioeconomic data. Thus, our strategy for reduction of the teacher group was to find the best predictors of achievement after the selected isolation and socioeconomic variables had been entered in the equation. These results are reported in our discussion of the path analysis.

PATH ANALYSIS

The next step in our analysis was to build a fully recursive model (Duncan, 1975) employing isolation and socioeconomic measures as exogenous variables, teacher (and school) as endogenous, and achievement as the dependent variable. Our strategy in selecting isolation and socioeconomic variables separately was based partly on logical analysis of the meanings of the variables, and partly on empirical data. As a first step in building the final diagram,

achievement was predicted from the variables IPRBGS, IPRSC, INDB, ICULT, and IMED. The first three listed entered the regression equation with probabilities less than 0.10, and the latter two with considerably higher (more than .025) probabilities. Thus, a second regression was calculated, using as predictors IPRBGS, IPRSC, IDNB, and the five median measures of teacher characteristics. In this analysis only one of the teacher variables, MDEXPB, entered the equation at less than 0.10. Thus, our basic model contains two socioeconomic predictors, IPRBGS and IPRSC, one isolation measure, IDNB, and one teacher variable, MDEXPB. A second regression, predicting MDEXPB from IPRBGS, IPRSC, and IDNB was used to produce Figure 1 using Wolfle's (1980, 1982) methods. Inclusion of other predictors which entered the equation at higher probability levels, such as ICULT, did not change the values reported by more than 0.01, and often by less. Thus, in the interests of a parsimonious model, we have sacrificed little information by being relatively stringent in deciding on the inclusion of variables in our model.

As Figure 1 shows, the direct effect of IPRBGS is considerably larger than the effects of IDNB, IPRSC, and MDEXPB, whose effects are all of the same order of magnitude. Both socioeconomic variables have a direct effect on MDEXPB, but the isolation measure does not. These results partially support one of our major predictions, that there would be an effect on achievement due to isolation beyond that due to socioeconomic variables. However, there is no support for the notion that this effect is due in part to the community's ability to attract and keep experienced teachers. The effect seems to be

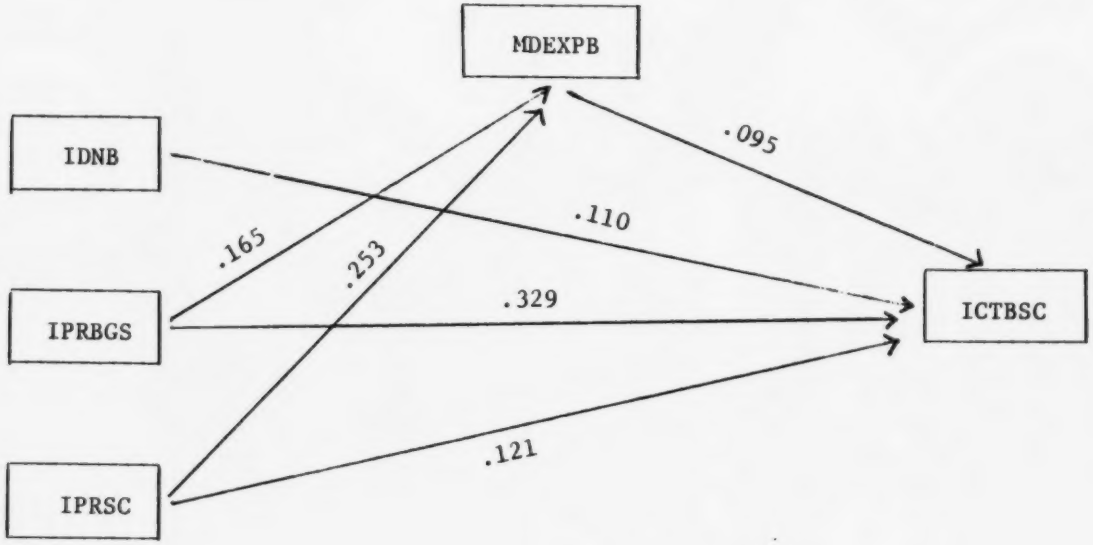

Figure 1

Path Diagram for Prediction of ICTBSC

direct only.

Following Wolfle (1980) again, Table 8 breaks down total relationships among the variables in Figure 1. Total associations are correlations, and total effects are standardized coefficients, in the first three cases, without the presence of MDEXPB in the regression equation, and in the last case, with MDEXPB alone as a predictor. Direct effects are path coefficients from the full model, and indirect the difference between total and direct effects. Spurious effects are effects due to a common cause (or causes, in this case the two socioeconomic variables), while joint associations are due to correlations with exogenous variables which are themselves correlated. It is interesting to note that, if the prediction of achievement had been made with MDEXPB only, then the spurious effects would not have been identified as such, and the effect of teacher experience would have been greatly exaggerated. The same can be expected of any other teacher variable, such as qualifications, although our measure of such, MDCET, did not enter our equations.

The most important interpretation of these results is that, to a large extent, achievement, at the community level, is a function of socioeconomic variables. However, even given socioeconomic information, considerable explanatory power remains to isolation. Both these effects are largely direct, that is, are a function of the students themselves rather than the teachers who are attracted to the community to teach them.

Table 8

Breakdown of Associations

Variable Pair	Total Association	Effects			Spurious	Joint Association
		Total	Direct	Indirect[1]		
IDNB & ICTBSC	.297	.112	.110	.002[2]	—	.185
IPRBGS & ICTBSC	.457	.345	.329	.016	—	.112
IPRSC & ICTBSC	.304	.145	.121	.024	—	.159
MDEXPB & ICTBSC	.239	.095	.095	0	.085	.059

[1] through MDEXPB

[2] not diagrammed in Figure 1

OTHER ACHIEVEMENT VARIABLES

A second question of major interest is whether the effects uncovered in the above analysis endure when the achievement is not the composite achievement measure, but one of the subtests. CTBS Reading and Mathematics scores were chosen for further analysis. Since our main concern here is isolation rather than different measures of achievement, this analysis is not as detailed. Figure 2 shows two path diagrams in which the variables selected on their ability to predict composite achievement were applied in the prediction of reading and mathematics scores. The results for reading are quite similar to those for composite achievement, and will not be discussed further. However, the results for mathematics achievement are considerably different. Specifically, neither the isolation variable nor the teacher variable have any predictive power. Each would have entered the prediction equation at a very high probability. This evidence is interesting enough to suggest that it might be worthwhile to deviate from our original purposes and repeat the entire process described for ICTBSC for ICTBSM. Thus, we selected the best predictors from the isolation and socioeconomic groups separately, combined these with the teacher variables, and built another path diagram.

When entering the isolation variables alone, only two, ITMED3 and IMED, entered at a reasonable level of significance, less than 0.10. ICULT would have entered third at 0.52. Three of the socioeconomic variables entered from that group, IPRBGS, ICPF, and IPRSC, all at less than 0.15. When these five variables were entered with the teacher variables, none of the teacher variables entered with

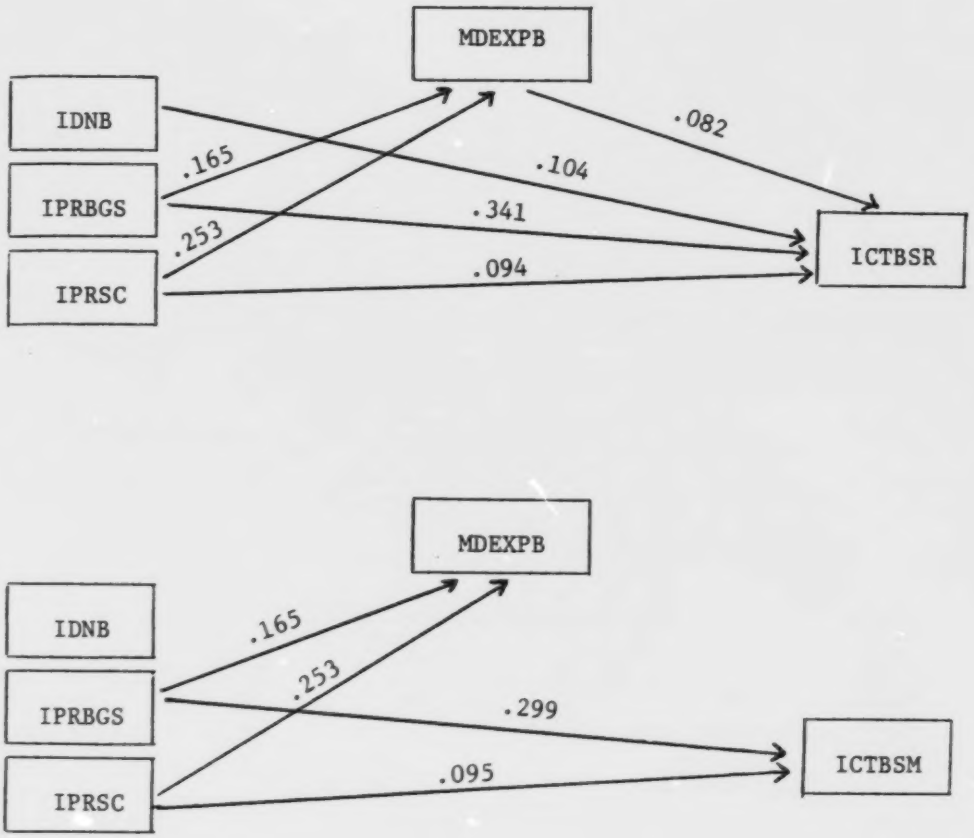

Figure 2

CTBSC Path Diagram Applied to CTBSR and CTBSM

a probability less than 0.60. Since a major concern in this study is the indirect effects of isolation and socioeconomic conditions on achievement through teachers, we considered it vital to have a teacher variable in our path, especially as our methods for choosing variables did not consider indirect effects. Thus, we deleted the least predictive isolation variable, IMED, and the least predictive socioeconomic variable, IPRSC, and forced one teacher variable, MDCET into the equation, at a level of 0.51. The results of this analysis are reported in Figure 3. Path coefficients usually considered too small to be included in such a diagram are reported here, merely to emphasize the point that only one of the variables, IPRBGS, has much of an effect on mathematics achievement. While the literature reports, and common sense suggests that mathematics, unlike reading, should be more school dependent and less community dependent, this has not been borne out by our data.

This concludes our major analysis, except for the issue of residual analysis. A major issue of this study has been the quantification of isolation, and its effect on achievement. We have avoided more empirical approaches to our data, although we are aware of their possibilities. Our intention was to build a path model with some theoretical meaning, and not to produce the highest possible multiple R by whatever methods. Thus, we have not investigated the potential of composite isolation scores, or for that matter, composite socioeconomic scores, based on, for example, factor analysis. Also, we have not investigated any nonlinear trends in our data. Both of these approaches are legitimate, and in fact, are part of our thinking as

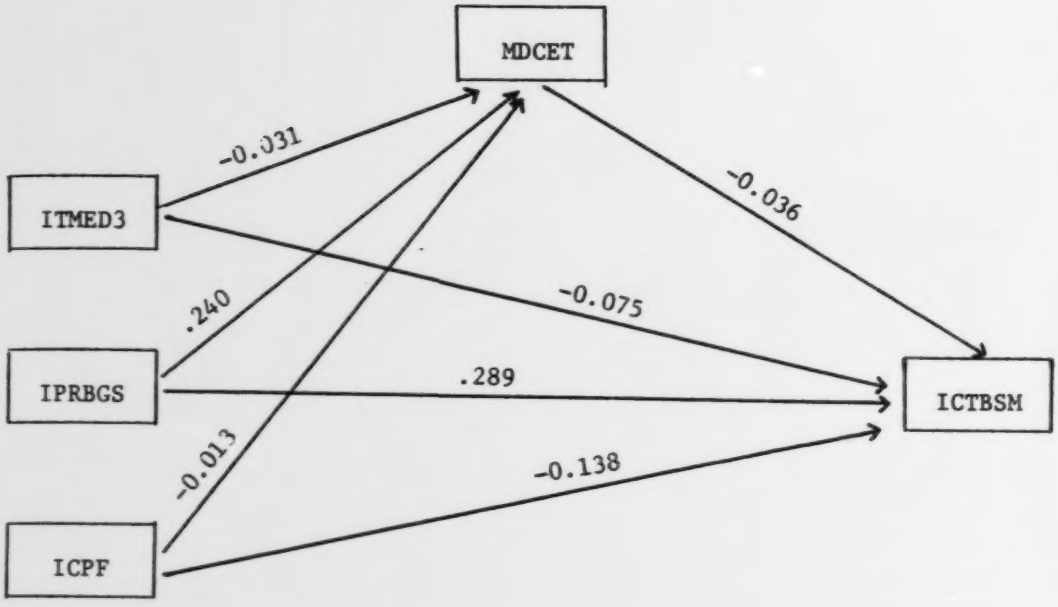

Figure 3

Path Diagram for ICTBSM

we plan secondary analysis of the data. However, at this stage, we close with some remarks on preliminary observations on the question of outliers.

OUTLIER ANALYSIS

Table 9 summarizes an outlier analysis, although its meaning is far from transparent at first glance. The first three columns give the name of each variable in our data set, along with their means and standard deviations for all the schools in our sample. These columns merely repeat some of the information of Table 4 for convenience. As a first step in this analysis, ICTBSC was predicted on the basis of IPRBGS alone, and residuals, the difference between actual and predicted ICTBSC, calculated. The twenty schools with the worst overpredictions (performance poorer than expected) and the twenty with the worst underpredictions (performance better than expected) were identified, and their mean values calculated for each of the variables listed in Table 9. Finally, the mean value on each of these variables was deviated from the mean of all 317 schools, and expressed as a fraction of a standard deviation unit. In this manner, the fourth and fifth columns of the table were produced. Similarly, the final two columns were produced by the same process, except that the initial prediction equation by which the outliers were identified used both IPRBGS and DNB as predictors.

An example may clarify the table. Reading across the first row of the table, NSTUD6, the number of grade six students in the school, averaged 24.656 across the entire sample, with a standard deviation of 23.032. (This high value reflects skewness in the data, a problem which we have chosen to ignore in this analysis.) The twenty schools who did most poorly compared with the prediction of their achievement on the basis of IPRBGS

Table 9

Deviations of Forty Worst Outliers from Overall Mean for Each Variable, with IPRBGS and IPRBGS + DNB as Predictors

Variable Names	Overall Mean (n=317)	Standard Deviation	Mean Values (Deviations in SD Units) (of Mean Values of 40 Worst Outliers)			
			IPRBGS as Predictor		IPRBGS + DNB as Predictors	
			Over (20) Predicted	Under (20) Predicted	Over 20 Predicted	Under 20 Predicted
NSTUD6	24.656	23.032	-0.48	-0.34	-0.49	-0.42
IENR	183.566	132.177	-0.33	-0.12	-0.43	-0.23
ICASE	8.513	7.137	-0.49	-0.28	-0.48	-0.33
ISTAFF	10.063	6.591	-0.35	-0.22	-0.44	-0.29
IRATIO	17.375	3.214	-0.37	-0.17	-0.49	-0.02
ICTBSV	16.464	3126	-1.23	1.35	-1.29	1.39
ICTBSR	29.118	4.716	-1.34	1.48	-1.48	1.571
ICTBSL	62.407	10.456	-1.58	1.56	-1.693	1.68
ICTBSW	46.941	7.042	-1.49	1.64	-1.66	1.74
ICTBSM	27.542	4.577	-1.17	1.480	-1.29	1.65
ICTBSC	183.167	27.448	-1.57	1.69	-1.69	1.83
MNAGE	31.035	5.088	- .21	-0.14	-0.38	-0.23
MDAGE	29.590	4.553	-0.09	0.21	-0.32	0.09
MNCET	4.100	0.731	-1.87	-0.21	-0.38	-0.24
MDCET	4.144	0.801	-0.41	-0.24	-0.36	-0.24
MNEXPT	9.248	4.169	-0.37	0.36	-0.65	0.24
MDEXPT	8.094	4.207	-0.12	0.65	-0.40	0.33
MNEXPB	6.783	3.127	-0.24	0.39	-0.62	0.32
MDEXPB	6.1506	3.0644	-0.14	0.51	-0.52	0.41
MNEXPD	2.469	2.220	-0.35	0.12	-0.34	0.006
MDEXPD	1.440	1.978	0.08	0.14	0.08	0.06
IPOP	1621	2104	-0.53	-0.37	-0.52	-0.41
IDNB	3.230	1.962	-0.24	-0.01	-0.14	-0.14
IDNBT4	69.580	83.552	0.23	-0.20	-0.20	-0.18
IDNBT6	121.811	94.428	0.45	-0.20	0.45	0.12
IMED	1.798	1.321	-0.41	-0.26	-0.41	-0.34
IMED45	3.322	1.748	-0.27	-0.10	-0.18	-0.15
ITMED1	27.577	41.925	0.47	0.04	0.413	0.03

Table 9 (continued)

Variable Names	Overall Mean (n=317)	Standard Deviation	Mean Values (Deviations in SD Units) (of Mean Values of 40 Worst Outliers)			
			IPRBGS as Predictor		IPRBGS + DNB as Predictors	
			Over (20) Predicted	Under (20) Predicted	Over 20 Predicted	Under 20 Predicted
ITMED2	52.139	58.190	0.24	-0.14	0.20	-0.13
ITMED3	103.063	84.589	0.55	-0.03	0.54	0.06
ICULT	2.129	1.676	-0.70	-0.22	-0.70	-0.25
IPRSC	0.228	0.137	-0.12	0.68	-0.36	0.59
IPRBGS	0.503	0.120	-0.12	-0.025	-0.06	0.06
IPRBS	0.090	0.049	-0.20	0.12	-0.20	0.08
IPRU	0.058	0.038	0.07	0.13	-0.02	0.13
IPRLFA	0.454	0.099	-0.06	0.10	-0.12	0.10
IPREMP	0.362	0.103	0.06	-0.02	0.02	-0.01
IPRNEM	0.302	0.320	-0.23	0.10	-0.23	0.08
IPRLPF	0.100	0.045	-0.02	0.04	-0.22	-0.04
IPREWH	0.359	0.155	0.04	0.05	-0.02	-0.09
IPREMH	0.576	0.148	0	-0.14	0.10	-0.09
ICPF	2.402	0.449	1.90	1.87	2.24	1.90
IWELDL	121.521	112.384	0.07	-0.12	0.04	-0.16

averaged 0.48 standard deviations (about 11 students) smaller than the entire sample average. The twenty schools who did best compared to their prediction on the basis of IPRBGS averaged 0.34 standard deviations (about eight students) smaller than the overall sample. Thus, it can be concluded on the basis of the first line of the table, that smaller schools, as expected, tend to be more difficult to predict on the basis of our chosen variables. This reflects, of course, the instability of the average ICTBSC scores of these smaller groups of students.

Table 9 has been broken horizontally into five sections, corresponding to size, achievement, teacher, isolation and socioeconomic variable types. The first section confirms, as might be expected, that smaller schools are difficult to predict. The second section demonstrates, again as might be expected, that very poor achieving schools tend to be overpredicted, while very high achieving schools tend to be underpredicted. Clearly, further analysis, at the level of scatter-plots, is called for.

The third group of variables show some interesting results. Overall, schools which were overpredicted tended to have teachers with somewhat less experience than the average (in the range of 0.25 standard deviations), while those which were underpredicted were more than one-third of a standard deviation above the average in teacher experience, and more than one-half a standard deviation above the overpredicted group. Note the anomolous value of MNCET for the overpredicted (by IPRBGS) group. This shows the danger of reliance on the mean rather than the median for analysis of this nature.

The fourth section of the table shows that the overpredicted group tends to be more isolated than the average, even when the second predictor, one of the isolation variables, is added. This is also true of the under-

predicted group, but their deviation from the average in isolation is less marked. Taking notice of the relationship between isolation and size, we might speculate that, among the smallest schools, those which are underpredicted are less isolated, while those that are overpredicted are more isolated. This suggests a non-linear trend, and, again, analysis of scatter plots.

Finally, the last section of Table 9 shows a very large and noticeable difference between the two groups of poorly predicted schools in IPRSC, the level of school attendance of those old enough to be free to leave school. This section also shows that both groups of poorly predicted schools are well above the average in family size. While this might in part reflect community size, the quite weak relationship between family size and all our other variables suggests that we have here a different and more interesting phenomenon. The overall weak effect of family size indicates that it tends not to be a major factor in achievement, at least at the level of aggregation of our data. However, in the case of these forty schools, the data suggest that family size is an important factor, in the first case, for poorer achievement, and in the second for better. While further speculation is clearly going beyond the limits of our data, one is tempted to consider the possibility that the effect of family support interacts in a subtle way with socioeconomic conditions, and that such effects are negligeable in larger communities, and noticeable, for both good and bad influence, in smaller communities. While this view is interesting, it is clearly overinterpretation of the data.

SUMMARY AND CONCLUSION

In this study, we attempted a path analytic investigation of the

influence of isolation on academic achievement. Our data consisted of, along with the isolation and achievement information, measures of teacher experience and qualification, and socioeconomic conditions in the form of both education and employment data. In the main data analysis, using composite achievement as the dependent variable, we found the largest effect for socioeconomic variables, but substantial effects for one of our isolation indices which measured access to retail shopping.

Although we had hypothesised that community isolation would have an effect on achievement indirectly through the ability of the community to attract and hold qualified teachers, our data did not support this hypothesis. The small indirect effects through teacher experience on achievement were initiated in our path diagram by the socioeconomic rather than the isolation variables.

Faced with a multitude of possible avenues for secondary analysis, we drew our study to a close at a somewhat arbitrary point. Analysis using mathematics rather than composite achievement as the dependent variable produced a different set of predictors in our path diagram. While the literature suggests that mathematics achievement should be more school related and less community related, our data did not support this notion. We did not pursue this issue in secondary analysis.

One of our concerns, on which we have barely touched in this report, is the existence of non-linear trends which might go unnoticed in our regression equations. To investigate this possibility, we isolated sets of schools whose achievement was either badly under-predicted or over-predicted in our equations, and then analysed these schools for any common characteristics. One commonality of both groups was their small size, even in comparison with our largely rural sample. While this phenomenon can be

explained easily in terms of error of measurement involving smaller units, other noticeable trends suggested non-linear interaction effects among our independent variables. While we have not pursued further analysis of outliers and non-linear trends, clearly such analysis holds much promise for the future.

The purpose of path analysis as opposed to ordinary multiple regression is to attempt to investigate the feasibility of causal links among the variables. Thus, at this point we feel compelled to discuss the relationship between socioeconomic conditions, isolated and school achievement in causal terms. On this, we must equivocate. We have avoided any discussion thus far of the inevitable fate of most rural communities, outmigration. While it might be tempting to suggest that isolation and socioeconomic conditions cause lower achievement, we must accept some contribution from an equally compelling hypothesis, that the average person who chose to leave the rural setting for more opportunity in an urban area took with him/her a better education and therefore better earning power than those who chose or were forced to stay in their home community. This is not to suggest that everyone in a rural community lacks the qualities for success in an urban environment, but merely to point out that we are measuring the educational background and economic situations of people who have remained in communities with a generations-old tradition, for better or worse, of "going down the road".

It is traditional in studies such as this to conclude with a discussion of the implications of the work and possible future directions. Causal arguments, clearly, are put forward only at great risk. This study was undertaken to investigate the effects of isolation, and thus had to contend with socioeconomic influences almost as nuisance variables. The

initial temptation is to put aside fundamental questions of cause-and-effect and argue for differential allocation of resources to counterbalance lack of background (in this case, due to isolation). However, such a stance presupposes an answer to the difficult question of whether schooling can provide a "catch-up" for what might be considered a deprived environment. Philosophical issues of causation aside, this compensatory view of schooling raises serious practical questions about the potential for the improvement of society through schooling, questions which our data are clearly not equipped to handle.

We have already mentioned in the discussion of results above the types of secondary analysis of outliers which we see as next steps with this data set. In addition, we can recommend another major study for which large scale demographic data are available, allowing an examination of migration trends and, in essence, shedding light on whether we are dealing, in the present data set, only with those who chose or were forced to stay behind in their home communities. The Canada Department of Health maintains change of address records for Family Allowance recipients, giving a ready source of information on within-Canada migration patterns among all those who have children. This information is kept at the level of postal codes, and thus, potentially, is a method of comparing those who have left rural communities with those who have stayed behind. The data, however, suffer from the limitation that much of the phenomenon of "moving to the big city" takes place before migrants become parents. However, given this caveat, such date would allow access to a population who could provide more complete answers to many of the issues posed by this study. If we were able to demonstrate that some of the variance in school achievement is, in a direct sense, due to isolation, then we would be in a position to

once again address the larger question of the extent to which schools should be expected to be an agent of social change.

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Appendix 1

Schools (i.e., Teachers) Removed Because of Lack of CTBS Scores

Roberts Arm

Cormack Elementary

Pollards Point

Sops Arm

Kings Point

Purbecks Cove

Dover

Seldom Come By (St. Augustine)

North West Brook

Queens Cove

St. Jones Within

Point Leamington

Fortune Harbour

Petite Forte

South East Bight

Marysvale

Terrenceville

Fortune Harbour

Appendix 2

K-3, 4, 5: Schools Recoded to Corresponding Grade 6

Original School Name	Recoded School Name	Original School Name	Recoded School Name
Reidville (St. James)	Main Dam Road	McIvers (K-5)	Cox's Cove
Jacksons Cove	Harry's Harbour	Meadows (K-4)	Gillams
Botwood Primary	Botwood Memorial	Stephenville Comm. Academy	Hillcrest Elem.
Springdale Primary	Springdale Elem.	Summerside St. Pauls	U.C. Elementary
Grand Falls Academy Primary	Grand Falls Academy Elementary	Bellburns	Daniels Harbour
Embree Elementary	Lewisporte Elem.	Salleys Cove	Rocky Harbour
Fogo	Joe Batts Arm	Foxtrap All Saints	St. Georges Elem.
Gander Academy Primary	Gander Junior High	Paradise Holy Inn	Topsail Elementary
Gander Academy Elementary		Flat Bay East	St. Georges, Our Lady of Mercy
Valleyfield	Badgers Quay	Heatherton	St. Fintans, Cassidy
Amherst Cove	Catalina	St. Georges Prim.	St. Georges Elem.
Catalina, St. Peters Elem.	Catalina Junior High	Lawn, St. Pauls (K-4)	Holy Name of Mary (4-11)
Clarenville (K-4)	Clarenville Elem.	Marystown Primary	Marystown Elem.
Harcourt (K-4)	Shoal Harbour	North River	All Hallows Elem.
Hatchet Cove (K-4)	Clarenville	Badger (Sacred Hrt)	Grand Falls Academy
Hodges Cove	Little Hearts Ease	Coachman's Cove	Fleur de Lys
Little Hearts Ease	Arnolds Cove	Little Bay	Little Bay Elem. Integ.
Newmans Cove	Catalina	Ferryland	St. Joseph's
Bryant's Cove	Upper Island Cove	Glenwood St. Annes	Gander St. Josephs
Dildo Primary	Dildo Elementary	Castor River North	Bud Cove
Freshwater Primary	Carbonear	Irishtown	Corner Brook All Hallows
New Harbour (K-2)	Dildo Elementary	St. Albans Holy X	Holy X Elementary
South River	Clarke's Beach	Our Lady of Fatima	Cow Head Integrated

Original School Name	Recoded School Name	Original School Name	Recoded School Name
Tilton	Spaniard's Bay	Degrau (Primary)	Degrau Elementary
Grand Bank Primary	Grand Bank Partanna	Mainland	Lourdes
Harfit Primary	Salt Pond, Don Jam.	Stephenville Prim.	St. Stephens Sr.
Wreck Cove	English Harbour West	Stephenville Junior Elementary	Elementary
Margaree	St. James, P. au P.	Stephenville Annex	
Mouse Island	St. James, P. au P.		
Roberts Collegiate Port aux Basques	St. James, P. au P.		

Appendix 3

Communities Served by Elementary Schools

School	Communities Served
*1. Cooks Harbour	01 Cooks Harbour
	02 Wild Bight
	03 Boat Harbour
	04 Cape Norman
Great Brehat	01 Brehat
Griquet	01 St. Lunaire
	02 Griquet
	03 Gunners Cove
	04 Quirpon
	05 Hays Cove
	06 Noddy Bay
Raleigh	01 Raleigh
Ship Cove	01 Ship Cove
St. Anthony	01 St. Anthony
	02 Goose Cove
	03 St. Anthony Bight
St. Carols	01 St. Carols
2. Bide Arm	01 Bide Arm
Brig Bay/Plum Point	01 St. Barbe
	02 Pigeon Cove
	03 Black Duck Cove
	04 Forresters Point
	05 St. Genevieve
	06 Pond Cove
	07 Blue Cove
	08 Plum Point
	09 Brig Bay
Englee	01 Englee

* The numbers refer to school boards.

School	Communities Served
Flowers Cove	01 Anchor Point
	02 Deadman's Cove
	03 Bear Cove
	04 Flowers Cove
	05 Nameless Cove
	06 Savage Cove
Lower Cove/Green Island	01 Eddy's Cove East
	02 Green Island Brook
	03 Sandy Cove
	04 Lower Cove
	05 Green Island Cove
	06 Pinescove
	07 Shoal Cove East
Main Brook	01 Main Brook - The Depot
Reefs Harbour	01 New Ferolle
	02 Ferolle
	03 Shoal Cove West
	04 Reefs Harbour
Roddicton	01 Wild Bight
	02 Roddicton
3. Cormack	01 Cormack
Deer Lake (High St.)	01 Deer Lake
(Main Dam Road)	02 Nicholsville, Spillway
	03 Reidville
	04 Pynn Brook
Hampden	01 Beaches
	02 Hampden
	03 Bayside
	04 Rooms

	School	Communities Served
	Harbour Deep	01 Harbour Deep
	Howley	01 Howley
	Jackson's Arm	01 Jackson's Arm
	Pasadena	01 Pasadena
	Sops Arm	01 Sops Arm
		02 Pollard Point
4.	Baie Verte	01 Baie Verte
	Beaumont	01 Lushs Bight
		02 Beaumont
		03 Beaumont North
	Brighton	01 Brighton
	Burlington	01 Burlington
		02 Smiths Harbour
	Harry's Harbour	01 Harry's Harbour
		02 Jackson Cove
	Kings Point	01 Kings Point
		02 Rattling Brook
	LaScie	01 Shoe Cove
		02 LaScie
		03 Tilt Cove
	Little Bay	01 Little Bay
		02 St. Patricks
	Little Bay Island	01 Little Bay Island
	Ming's Bight	01 Ming's Bight
	Nippers Harbour	01 Nipper's Harbour
	Pilleys Island	01 Pilley's Island

School	Communities Served
Purbeck Cove	01 Purbeck Cove
Roberts Arm	01 Roberts Arm
Round Harbour	01 Round Harbour
Seal Cove	01 Seal Cove
Springdale	01 Springdale
	02 Sheppardsville (Springdale)
Triton	01 Triton(Jims Cove, Cards Harbour)
Westport	01 Westport
Wild Cove	01 Wild Cove
Woodstock	01 Woodstock
	02 Hacket
Badger	01 Badger
Bishops Falls	01 Bishops Falls
Botwood	01 Botwood
	02 Peterview
	03 Northern Arm
	04 Phillips Head
Buchans	01 Buchans
Cottrells Cove	01 Cottrells Cove
Grand Falls	01 Grand Falls
Leading Tickles	01 Leading Tickles
	02 Glovers Harbour
Millertown	01 Millertown
Point Leamington	01 Point Leamington
	02 Pleasant View
Windsor	01 Windsor

School	Communities Served
Change Islands	01 Change Island
Comfort Cove	01 Comfort Cove
	02 Newstead
	03 Turtle Creek
Durrells	01 Durrells
Lewisporte	01 Laurenceton
	02 Browns Arm
	03 Porterville
	04 Stanhope
	05 Embree
	06 Little Burnt Bay
	07 Lewisporte
Loon Bay	01 Campbellton
	02 Michaels Harbour
	03 Loon Bay
	04 Birchy Bay
	05 Gayside
Moreton's Harbour	01 Fizzards Harbour
	02 Moreton's Harbour
	03 Bridgeport
	04 Whales Gulch
	05 Chance Port
Newville	01 Cobbs Arm
	02 Pikes Arm
	03 Too Good (Rodgers Cove)
	04 Salt Harbour
	05 Fairbanks
	06 Newville
	07 Sunnyside
	08 Herring Neck
	09 Meritts Harbour
	10 Indian Cove
	11 Hillgrade

School	Communities Served
Norris Arm	01 Norris Arm North
	02 Norris Arm South
Summerford	01 Boyds Cove
	02 Summerford
	03 Carters Cove
	04 Virgin Arm
	05 Cottlesville
Twillingate	01 Bluff Head Cove
	02 Twillingate
	03 Kettle Cove
	04 Little Harbour
	05 Paradise
	06 Wild Cove
	07 Manuels Cove
	08 Crow Head
	09 Gillsport
7. Aspen Cove	01 Aspen Cove
	02 Goodwill
Carmanville	01 Carmanville
	02 Noggin Cove
Dark Cove	01 Dark Cove
	02 Middle Brook
	03 Gambo
Davidsville	01 Main Point
	02 Davidsville
Deep Bay	01 Deep Bay
Dover	01 Dover
Eastport	01 St. Chads
	02 Brownside
	03 Salvage
	04 Eastport
	05 Sandringham

School	Communities Served
Eastport (continued)	06 Sandy Cove
	07 Happy Adventure
Fredericton	01 Fredericton
Gander	01 Gander
	02 Benton
Glenwood	01 Glenwood
	02 Appleton
Glovertown	01 Glovertown
	02 Traytown
	03 Terra Nova
	04 Coles Harbour
	05 Charlottetown
Hare Bay	01 Hare Bay
Horwood	01 Horwood
Island Harbour	01 Island Harbour
Joe Batts Arm	01 Joe Batts Arm
Ladle Cove	01 Ladle Cove
	02 Shoal Harbour
Musgrave Harbour	01 Musgrave Harbour
Port Albert	01 Port Albert
Seldom Come By	01 Seldom
	02 Little Seldom
Stag Harbour	01 Stag Harbour
Victoria Cove	01 Victoria Cove
	02 Harris Point
	03 Georges Point
	04 Parks Head
	05 Rogers Cove

School	Communities Served
8. Badgers Quay	01 Valleyfield
	02 Badgers Quay
	03 Pools Island
Greenspond	01 Greenspond
Lumsden	01 Deadman's Bay
	02 Cape Freels
	03 Lumsden
Newtown	01 Newtown
Trinity, Bonavista Bay	01 Centreville
	02 Wareham
	03 Indian Bay
	04 Trinity
Wesleyville	01 Wesleyville
	02 Brookfield
	03 Pound Cove
	04 Templeman
9. Swift Current	01 North Harbour
	02 Swift Current
	03 Garden Cove
Arnold's Cove	01 Little Harbour East
	02 Arnold's Cove
Bonavista	01 Bonavista
	02 Elliston
	03 Spillers Cove
Burgoyn's Cove	01 Burgoyn's Cove
Canning Cove	01 Canning Cove
Catalina	01 Catalina
	02 Amherst Cove
	03 Newman's Cove

School	Communities Served
Clarenville	01 Harcourt
	02 Monroe
	03 Hatchet Cove
	04 North West Brook
	05 Clarenville
Come-By-Chance	01 Come-By-Chance
Deep Bight	01 Deep Bight
Elliston	01 Elliston
Georges Brook	01 Georges Brook
Gooseberry Cove	01 Southport
	02 Gooseberry Cove
Hickman's Harbour	01 Britannia
	02 Petley
	03 Aspey Brook
	04 Snooks Harbour
	05 Elliotts Cove
	06 Weybridge
	07 Ladycove
Hillview	01 Hillview
Lethbridge	01 Winterbrook
	02 Jamestown
	03 Portland
	04 Lethbridge
	05 Sweet Bay
	06 Charleston
	07 Princeton
Little Catalina	01 Little Catalina
Little Hearts Ease	01 Little Hearts Ease
	02 Long Beach

School	Communities Served
Musgravetown	01 Musgravetown
North Harbour	01 North Harbour
North West Brook	01 North West Brook
Old Bonaventure	01 Old Bonaventure
Port Blandford	01 Port Blandford
	02 Muddy Brook
Port Rexton	01 Port Rexton
	02 Champneys East
	03 Champneys West
	04 English Harbour West
	05 Trinity
	06 Dunfield
	07 Trouty
	08 Trinity East
Queen's Cove	01 Queen's Cove
Shoal Harbour	01 Georges Brook
	02 Milton
St. Jones Within	01 St. Jones Within
Sunnyside	01 Sunnyside
10. Bay de Verde	01 Bay de Verde
	02 Red Head Cove
Bay Roberts	01 Bay Roberts
	02 Coleys Point
Brigus	01 Brigus
	02 Cupids
	03 Georgetown
Carbonear	01 Carbonear
Chance Cove	01 Chance Cove
Chapel Arm	01 Chapel Arm

School	Communities Served
Clarkes Beach	01 Clarkes Beach
	02 South River
	03 Makinsons
Coley's Point	01 Coley's Point
Dildo	01 Dildo
	02 New Harbour
	03 Old Shop
Dunville	01 Dunville
Fairhaven	01 Fairhaven
Greens Harbour	01 Greens Harbour
Hants Harbour	01 Hants Harbour
	02 Sibleys Cove
Harbour Grace	01 Harbour Grace
Hearts Content	01 Hearts Content
Hearts Delight	01 Hearts Delight - Islington
	02 Hearts Desire
Norman's Cove	01 Norman's Cove
Old Perlican	01 Old Perlican
	02 Brownsdale
	03 New Melbourne
Port de Grave	01 Port de Grave
Shearstown	01 Shearstown
	02 Butlerville
Spaniards Bay	01 Spaniards Bay
Upper Island Cove	01 Upper Island Cove
	02 Bryans Cove
	03 Bishops Cove

School	Communities Served
Victoria	01 Victoria
	02 Salmon Cove
Western Bay	01 Western Bay
	02 Burnt Point
	03 Jobs Cove
	04 Caplin Cove
	05 Lower Island Cove
Whitbourne	01 Whitbourne
	02 Markland
Winterton	01 Winterton
	02 New Perlican
11. Bell Island	01 Bell Island
Pouch Cove	01 Pouch Cove
Paradise	01 Paradise
	02 Topsail
12. Baine Harbour	01 Baine Harbour
Bay L'Argent	01 Bay L'Argent
	02 Jacques Fontaine
Boat Harbour	01 Boat Harbour
Brookside	01 Brookside
Burin	01 Burin
	02 Bools Cove
	03 Salmonier
	04 Long Cove
	05 Black Duck Cove
	06 Brown Bay
	07 Collins Cove
	08 Kirbys
Fortune	01 Fortune

School	Communities Served
Garnish	01 Garnish
	02 Frenchman's Cove
Grand Bank	01 Grand Beach
	02 Grand Bank
Grand le Pierre	01 Grand le Pierre
Harbour Mille	01 Harbour Mille
	02 Little Harbour
Lamaline	01 Lamaline
Little Bay East	01 Little Bay East
Monkstown	01 Monkstown
Salt Pond	01 Frenchman's Cove
	02 Winterland
	03 Hepworth
	04 Lewins Cove
	05 Port au Bras
	06 Bulls Cove
13. Belleoram	01 Belleoram
English Harbour West	01 St. Jacques
	02 English Harbour West
	03 Mose Ambrose
	04 Boxey
	05 Coomb's Cove
	06 Red Cove
Francois	01 Francois
Gaultois	01 Gaultois
Harbour Breton	01 Harbour Breton
Hermitage	01 Hermitage
	02 Sandyville
McCallum	01 McCallum

School	Communities Served
Milltown	01 Milltown
	02 Head of Bay D'Espoir
	03 Morrisville
Pool's Cove	01 Pool's Cove
Rencontre East	01 Rencontre East
Seal Cove	01 Seal Cove
14. Burnt Island	01 Burnt Island
Channel, Port aux Basques	01 Channel, Port au Basques
	02 Cape Ray
Codroy	01 Codroy
Grand Bruit	01 Grand Bruit
Isle aux Morts	01 Isle aux Morts
La Poile	01 La Poile
Margaree	01 Margaree
Petites	01 Petites
Rose Blanche	01 Rose Blanche
	02 Harbour le cou
	03 Diamond
Gallants	01 Gallants
Gillams	01 Gillams
Lark Harbour	01 Meadows
	02 York Harbour
	03 Lark Harbour
McKays	01 Robinsons
	02 Cartyville
	03 McKays
	04 Jeffreys
St. Georges	01 St. Georges

	School	Communities Served
	Stephenville	01 Stephenville
	Summerside	01 Summerside
16.	Cow Head	01 Cow Head
	Daniels Harbour	01 Daniels Harbour
	Hawkes Bay	01 Hawkes Bay 02 Port Saunders
	Norris Point	01 Norris Point
	Parsons Pond	01 Parsons Pond 02 Three Mile Rock
	River of Ponds	01 River of Ponds
	Rocky Harbour	01 Rocky Harbour 02 Sally's Cove
	St. Pauls Inlet	01 St. Pauls Inlet
	Trout River	01 Trout River
	Wiltondale	01 Wiltondale
	Woody Point	01 Woody Point 02 Glenburnie 03 Curzon 04 Steal Brook 05 Birchy Head
17.	Burgeo	01 Burgeo
18.	Ramea	01 Ramea 02 Grey River
19.	Long Pond	01 Long Pond 02 Foxtrap
	Topsail	01 Paradise 02 Topsail 03 Chamberlains 04 Manuels

School	Communities Served
Upper Gullies	01 Kelligrews
	02 Upper Gullies
	03 Seal Cove
	04 Holyrood

Roman Catholic School Boards

School	Communities Served
20. St. Fintans	01 Highlands
	02 Lochleven
	03 St. Fintans
	04 St. Davids
St. Georges	01 Flat Bay
	02 St. Theresas
	03 St. Georges
Stephenville	01 Stephenville
	02 Maddis Point
	03 Black Duck
Upper Ferry	01 St. Andrews
	02 Thompkins
	03 Benoits Siding
	04 Doyles
	05 Upper Ferry
	06 Thurston
	07 Millville
	08 Great Codroy
	09 O'Regans
	10 Woodville
	11 Codroy
21. Burin	01 Burin
	02 Salt Pond
	03 Salmonier
	04 Fox Cove
	05 Corbin
	06 Mortier
	07 Port au Bras
English Harbour East	01 English Harbour East

School	Communities Served
Lamaline	01 Lamaline
	02 Point May
	03 Point au Gaul
	04 Lords Cove
	05 Taylor's Bay
Lawn	01 Lawn
Marystown	01 Marystown
	02 Creston
	03 Little Bay
	04 Beau Bois
	05 Jean de Baie
	06 Spanish Room
	07 Mooring Cove
Petite Forte	01 Petite Forte
Rushoon	01 Rushoon
	02 Parkers Cove
	03 Baine Harbour
St. Bernards	01 St. Bernards
St. Lawrence	01 St. Lawrence
	02 Little St. Lawrence
South East Bight	01 South East Bight
Terrenceville	01 Terrenceville
Avondale	01 Avondale
Chapel Arm	01 Long Harbour
	02 Mount Arlington
	03 Whitbourne
	04 Chapel Arm
	05 Belleview
	06 Blaketown

School	Communities Served
Colliers	01 Colliers
Conception Harbour	01 Conception Harbour
Harbour Main	01 Harbour Main
Holyrood	01 Holyrood
23. Brigus	01 Brigus
	02 Cupids
	03 Cupids Crossing
	04 Roaches Line
	05 Marysvale
Carbonear	01 Carbonear
Harbour Grace	01 Spaniards Bay
	02 Tilton
	03 Upper Island Cove
	04 Bristols Hope
	05 Harbour Grace
	06 Bryants Cove
	07 Riverhead, Harbour Grace
	08 Southside, Harbour Grace
Hearts Desire	01 Hearts Desire
	02 Hearts Delight
Marysvale	01 Marysvale
North River	01 North River
	02 Hallstown
	03 Bay Roberts
	04 Shearstown
	05 Country Road
	06 Coleys Point
	07 Clarkes Beach
	08 South River
	09 Mackinsons

School	Communities Served
Northern Bay	01 Kingston
	02 Gull Island
	03 Northern Bay
	04 Jobs Cove
	05 Ochre Pit Cove
	06 Western Bay
24. Badger	01 Badger
Baie Verte	01 Baie Verte
	02 Coachmans Cove
Bishops Falls	01 Bishops Falls
Brents Cove	01 Harbour Round
	02 Brents Cove
	03 LaScie
Buchans	01 Buchans
	02 Buchans Junction
Fleur de Lys	01 Fleur de Lys
Fortune Harbour	01 Fortune Harbour
Grand Falls	01 Grand Falls
25. Bay Bulls	01 Bay Bulls
Cape Broyle	01 Brigus South
	02 Admirals Cove
	03 Cape Broyle
Ferryland	01 Calvert
	02 Ferryland
	03 Aquaforte
Renews	01 Port Kirwin
	02 Renews
	03 Kingman Cove
	04 Cappahayden

School	Communities Served
St. Shotts	01 St. Shotts
Tors Cove	01 Bauline South
	02 Burnt Cove
	03 St. Michaels
	04 Tors Cove
Trepassey	01 Holyrood South
	02 Biscay Bay
	03 Trepassey
	04 Portugal Cove South
Witless Bay	01 Mobile
	02 Witless Bay
26. Fogo	01 Fogo
Gander	01 Gander
	02 Glenwood
	03 Appleton
Gambo	01 Gambo
Island Harbour	01 Island Harbour
Kings Cove	01 Stock Cove
	02 Knights Cove
	03 Kings Cove
	04 Keels
	05 Duntara
	06 Redcliff
	07 Tickle Cove
	08 Open Hall
Plate Cove	01 Plate Cove East
	02 Plate Cove West
	03 Summerville
	04 Princeton

	School	Communities Served
	Port Union	01 Bonavista
		02 Little Catalina
		03 Port Union
		04 Melrose
	St. Brendans	01 St. Brendans
	Tilting	01 Tilting
27.	Benoits Cove	01 Halfway
		02 Johns Beach
		03 Benoits Cove
		04 Frenchmans Cove
	Bird Cove	01 New Ferolle
		02 Castors
		03 Eddys Cove
		04 Brig Bay
		05 Plum Point
	Conche	01 Conche
	Croque	01 Croque
	Goose Cove	01 Goose Cove
	Grand Oise	01 St. Juliens
	Harbour Breton	01 Harbour Breton
	Pasadena	01 Pasadena
	Port au Choix	01 Port Saunders
		02 Eddys Cove West
		03 Port au Choix
	St. Albans	01 Bay D'Espoir
	St. Jacques	01 St. Jacques

	School	Communities Served
28.	Branch	01 Branch
	Dunville	01 Dunville
	Fox Harbour	01 Fox Harbour
	Freshwater	01 Freshwater
	Jerseyside	01 Jerseyside
	Mount Carmel	01 Mount Carmel
		02 North Harbour
		03 Colinet
	Placentia	01 Little Barrisway
		02 Point Verde
	Point Lance	01 Point Lance
	Ship Harbour	01 Ship Harbour
	Southern Harbour	01 Southern Harbour
		02 Come-by-Chance
	St. Brides	01 St. Brides
		02 Patricks Cove
		03 Angels Cove
		04 Gooseberry Cove
		05 Cuslett
	St. Josephs	01 Admirals Beach
		02 O'Donnells
		03 St. Josephs
		04 New Bridge
		05 Forest Field
	St. Marys	01 Riverhead
		02 Mall Bay
		03 Point la Haye
		04 Gaskers

School	Communities Served
St. Vincents	01 Peters River
	02 St. Stephens
	03 St. Vincents
29. DeGrau	01 Sheaves Cove
	02 Marches Point
	03 DeGrau
	04 Red Brook
	05 Cape St. George
Kippens	01 Kippens
Lourdes	01 West Bay
	02 Lourdes
	03 Salmon Cove
	04 Three Rock Cove
	05 Mainland
	06 Black Duck Brook
Picadilly	01 West Bay Centre
	02 Picadilly
	03 Abrahams Cove
	04 Ship Cove
	05 Lower Cove
	06 Campbells Creek
Port au Port East	01 Romaines
	02 Port au Port East
	03 Port au Mort
	04 Fox Island River
Port au Port West	01 Port au Port West
	02 Aquathuna
	03 Boswarlos
Stephenville	01 Stephenville
	02 North Pond
	03 Cold Brook

Pentecostal School Board

School	Communities Served
31. Badger	01 Badger
Beachside	01 Beachside
Birchy Bay	01 Birchy Bay 02 Gayside
Bishops Falls	01 Bishops Falls 02 Grenfell Heights
Botwood	01 Botwood 02 Peterview
Browns Arm	01 Stanhope 02 Porterville 03 Browns Arm
Cards Harbour	01 Brighton 02 Triton 03 Cards Harbour
Carmanville	01 Carmanville 02 Fredericton 03 Noggin Cove 04 Port Albert
Embree	01 Embree
Goobies	01 North Harbour 02 Goobies
Hawkes Bay	01 Hawkes Bay 02 Port Saunders
Horwood	01 Horwood
Laurenceton	01 Laurenceton
Burlington	01 Smiths Harbour 02 Burlington
Mings Bight	01 Mings Bight
Northwest Brook	01 Northwest Brook

School	Communities Served
Pacquet	01 Pacquet
Point aux Bay	01 Point aux Bay
Port Anson/Miles Cove	01 Port Anson
	02 Miles Cove
Port de Grave	01 Port de Grave
	02 Bareneed
	03 Bay Roberts
	04 Hibbs Cove
Roberts Arm	01 Roberts Arm
	02 Pelleys Island
Roddickton	01 Englee
	02 Roddickton
Seal Cove	01 Seal Cove
Seldom	01 Seldom
	02 Seldom Come By
	03 South Brook
Springdale	01 Springdale
	02 Sheppardsville
St. Lunaire	01 Quirpon
	02 Noddy Bay
	03 Ship Cove
	04 Raleigh
	05 Jobs Cove
Stephenville	01 Boswarlos
	02 Kippens
	03 Stephenville
Stoneville	01 Stoneville
Summerford	01 Carters Cove
	02 Virgin Arm
	03 Whales Gulch

School	Communities Served
Victoria	01 Victoria
	02 Carbonear
Windsor	01 Windsor
	02 Grand Falls

Appendix 4

Frequency Distribution of Variables

Table I

CTBS Vocabulary Scores (CTBSV)

CTBSV	Frequency
10.0 or less	4
10.1 - 12.0	19
12.1 - 14.0	50
14.1 - 16.0	79
16.1 - 18.0	72
18.1 - 20.0	54
20.1 - 22.0	24
22.1 - 24.0	11
24.1 - 26.0	4

Table II

CTBS Reading Scores (CTBSR)

CTBSR	Frequency
16.0 or less	1
16.1 - 20.0	6
20.1 - 24.0	34
24.1 - 28.0	103
28.1 - 32.0	93
32.1 - 36.0	56
36.1 - 40.0	20
More than 40.0	4

Table III

CTBS Language Scores (CTBSL)

CTBSL	Frequency
50.0 or less	37
50.1 - 55.0	36
55.1 - 60.0	53
60.1 - 65.0	64
65.1 - 70.0	57
70.1 - 75.0	38
75.1 - 80.0	15
More than 80.0	17

Table IV

CTBS Study Skills (CTBSW)

CTBSW	Frequency
35.0 or less	15
35.1 - 40.0	31
40.1 - 45.0	74
45.1 - 50.0	100
50.1 - 55.0	58
55.1 - 60.0	27
60.1 - 65.0	8
65.1 - 70.0	3
More than 70.0	1

Table V

CTBS Mathematics Scores (CTBSM)

CTBSM	Frequency
15.0 or less	1
15.1 - 20.0	8
20.1 - 25.0	85
25.1 - 30.0	144
30.1 - 35.0	60
35.1 - 40.0	16
40.1 - 45.0	1
45.1 - 50.0	2

Table VI

CTBS Composite Scores (CTBSC)

CTBSC	Frequency
100 or less	1
101 - 130	3
131 - 160	60
161 - 190	136
191 - 220	91
221 - 250	23
251 - 280	2
280 or more	1

Table VII

School Type (SCHTYP)

School Type (grades taught)	Frequency
K or 1 to 6	176
K or 1 to 7	32
K or 1 to 8	34
4 - 6	7
6 - 8	2
K - 8: Other Grouping	18
K or 1 to 9 or 10	14
K or 1 to 11	31
Others not listed	2

Table VIII

Number of Students in Grade 6 (NSTUD6)

NSTUD6	Frequency
Less than 10	89
11 - 20	81
21 - 40	94
41 - 60	29
61 - 80	13
81 - 100	5
101 - 120	3
121 - 140	1
141 - 160	2

Table IX

School Enrolment (IENR)

IENR	Frequency
25 or less	15
26 - 50	23
51 - 100	53
101 - 200	114
201 - 300	58
301 - 400	33
401 - 500	13
501 - 600	3
More than 600	5

Table X

Number of Teachers: K-6 (ICASE)

ICASE	Frequency
5 or Less	128
6 - 10	105
11 - 15	47
16 - 20	16
21 - 25	7
26 - 30	8
31 - 35	2
36 or more	4

Table XI

Number of Staff in School (ISTAFF)

ISTAFF	Frequency
5 or Less	88
6 - 10	105
11 - 15	66
16 - 20	36
21 - 25	13
26 - 30	6
31 - 35	1
36 or more	2

Table XII

Pupil-Teacher Ratio (IRATIO)

IRATIO	Frequency
5.0 or less	2
5.1 - 10.0	6
10.1 - 15.0	49
15.1 - 20.0	202
20.1 - 25.0	57
25.1 - 30.0	0
30.1 or more	1

Table XIII

Mean and Median Age of Teachers (MNAGE, MDAGE)

	Frequency	
	MNAGE	MDAGE
24.9 or less	24	28
25.0 - 29.9	107	147
30.0 - 34.9	124	106
35.0 - 39.9	52	28
40.0 - 44.9	6	3
45.0 or more	4	5

Table XIV

Mean and Median Teaching Certificate (MNCET, MDCET)

	Frequency	
Certificate Range	MNCET	MDCET
Less than 2.0	2	2
2.0 - 2.9	9	16
3.0 - 3.9	100	76
4.0 - 4.9	173	181
5.0 - 5.9	31	39
6.0 or more	2	3

Table XV

Mean and Median Teaching Experience

(MNEXPT, MDEXPT, MNEXPB, MDEXPB, MNEXPD, MDEXPD)

Teaching Experience	Frequency					
	MNEXPT	MDEXPT	MNEXPB	MDEXPB	MNEXPD	MDEXPD
Less than 1.0	6	6	7	8	85	152
1.0 - 1.9	5	7	11	18	63	83
2.0 - 2.9	10	14	15	13	58	40
3.0 - 3.9	13	15	21	28	44	19
4.0 - 4.9	10	22	27	41	35	7
5.0 - 9.9	133	156	188	175	29	12
10.0 - 14.9	116	76	46	32	1	2
15.0 - 19.9	20	17	0	0	1	1
20.0 - 24.9	1	1	0	0	0	0
25.0 or more	3	3	2	2	1	6

EXPT - Total teaching experience

EXPB - Teaching experience with the current board

EXPD - Teaching experience elsewhere

Table XVI

Size of Community (IPOP)

IPOP	Frequency
99 or less	7
100 - 249	2
250 - 499	55
500 - 999	75
1000 - 1499	61
1500 - 1999	26
2000 - 2999	24
3000 - 3999	9
4000 - 4999	5
5000 - 5999	10
6000 - 6999	7
7000 - 7999	1
8000 - 8999	3
9000 - 9999	1
10000 or more	5

Table XVII

Commercial Index (IDNB)

IDNB	Frequency
0	22
1	62
2	44
3	34
4	62
5	41
6	45
7	7

Table XVIII

Medical Facilities in the Community (IMED)

IMED	Frequency
1	183
2	74
3	26
4	10
5	6
6	14
7	1

Table XIX

Medical and Commercial Indices Within Commuting Distance

(IDNB, IMED45)

Level	Frequency	
	IMED45	IDNB
0	-	22
1	65	62
2	43	44
3	76	34
4	38	62
5	42	41
6	51	45
7	-	7

Table XX

Cultural Facilities in the Community (ICULT)

ICULT	Frequency
0	59
1	87
2	47
3	45
4	42
5	37

Table XXI

Travel Times to Minor and Major Centre

(IDNBT4, IDNBT6, ITMED2, ITMED3)

Travel Times	Frequency			
	IDNBT4	IDNBT6	ITMED2	ITMED3
Less than 50	187	75	199	91
50 - 99	70	91	82	85
100 - 149	16	45	15	47
150 - 199	14	53	9	53
200 - 249	10	22	6	19
250 - 299	6	12	4	12
300 - 349	7	4	1	4
350 or more	7	15	1	6

Appendix 5

Socioeconomic Variables

Table 1

Proportion of 15-24 year olds still in school (IPRSC)

IPRSC (X1000)	Frequency
99 or less	50
100 - 149	22
150 - 199	46
200 - 249	62
250 - 299	62
300 - 349	27
350 - 399	17
400 - 499	20
500 or more	12

Table II

Proportion of Adults with More Than Grade 8 (IPRBGS)

IPRBGS (X1000)	Frequency
199 or less	3
200 - 299	8
300 - 399	53
400 - 449	44
450 - 499	50
500 - 549	50
550 - 599	45
600 - 649	31
650 or more	33

Table III

Proportion of Adults with Some Post-Secondary, Non-University (IPRPS)

IPRPS (X1000)	Frequency
49 or Less	62
50 - 99	132
100 - 149	84
150 - 199	30
200 - 299	8
300 or More	1

Table IV

Proportion of Adults with Some University (IPRU)

IPRU (X1000)	Frequency
24 or Less	54
25 - 49	92
50 - 74	81
75 - 99	43
100 - 124	27
125 or More	20

Table V

Proportion of Adults in Labour Force

(Employed and Unemployed) (IPRLFA)

IPRLFA (X1000)	Frequency
200 or Less	9
300 - 349	31
350 - 399	48
400 - 449	69
450 - 499	52
500 - 549	60
550 or More	48

Table VI

Proportion of Adults Not in School Who Are Employed (IPREMP)

IPREMP (X1000)	Frequency
199 or Less	16
200 - 249	19
250 - 299	50
300 - 349	57
350 - 399	57
400 - 449	58
450 - 499	36
500 or More	24

Table VII

Ratio of Unemployed to Employed Adults (IPRNEM)

IPRNEM (X1000)	Frequency
99 or Less	31
100 - 199	86
200 - 299	93
300 - 399	51
400 - 499	19
500 - 599	13
600 - 699	6
700 - 799	3
800 - 899	5
900 - 999	2
1,000 or more	8

Table VIII

Proportion of Lone Parent Families (IPRLPF)

IPRLPF (X1000)	Frequency
24 or Less	15
25 - 49	16
50 - 74	53
75 - 99	82
100 - 124	62
125 - 149	47
150 - 199	33
200 or More	9

Table IX

Ratio of Employed Wives and Lone Parents to Working Husbands (IPREWH)

IPREWH (X1000)	Frequency
199 or Less	39
200 - 299	67
300 - 399	88
400 - 499	55
500 - 599	43
600 or More	25

Table X

Proportion of Husbands Working (IPREMH)

IPREMH (X1000)	Frequency
199 or Less	7
200 - 299	6
300 - 399	18
400 - 499	61
500 - 599	71
600 - 699	86
700 - 799	50
800 or more	18

Table XI

Number of Children Per Family (ICPF)

ICPF	Frequency
1.99 or Less	1
2.00 - 2.49	1
2.50 - 2.99	29
3.00 - 3.49	176
3.50 - 3.99	89
4.00 or More	21

Does not include childless couples.

Table XII

Welfare Dollars Per Capita (IWELDL)

IWELDL (nearest dollar)	Frequency
49 or less	56
50 - 99	104
100 - 199	123
200 - 299	17
300 - 399	7
400 - 499	3
500 - 599	2
600 - 699	2
700 - 799	1
800 - 899	1
900 or More	1